 WITH METALLURGICAL SECTION

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LII No. 1332 SATURDAY, JANUARY 6, 1945 REGISTERED AS A NEWSPAPER 6D. PER COPY POST FREE 8D.

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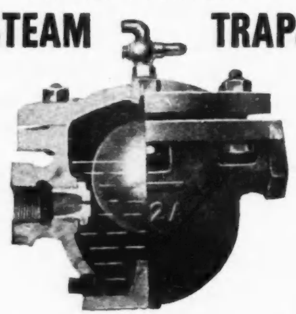

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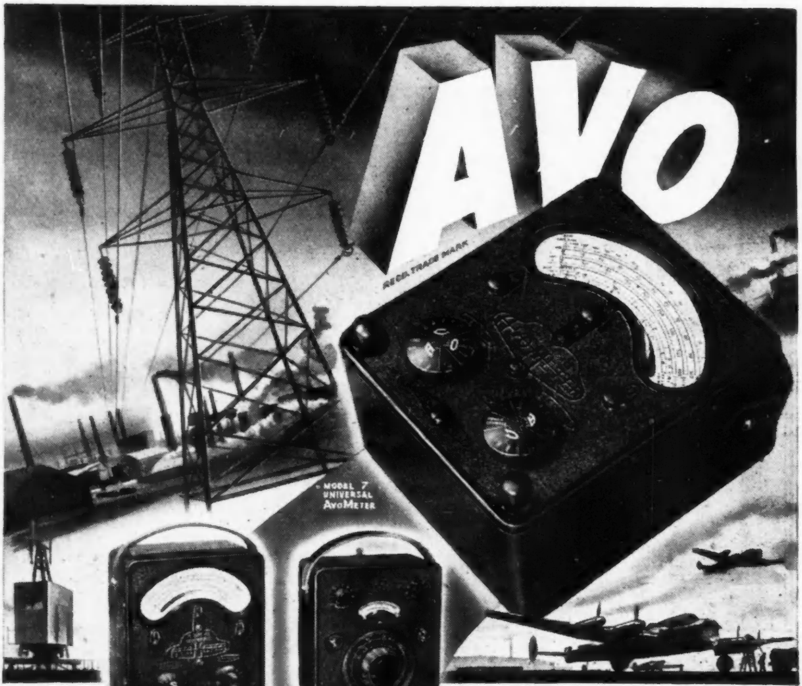

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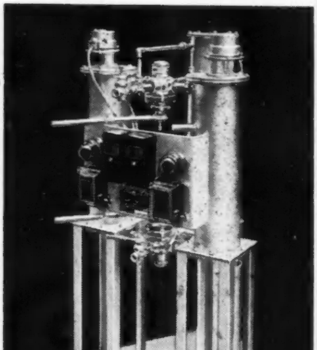

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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The Road to Industrial Efficiency

AN increased standard of living is the aim of everyone. Whereas the industrialist plans how it can be brought about, seeing incidentally many difficulties in the way, the politician, blithe spirit that he is, light-heartedly promises the moon and is content to state confidently that "the money will be forthcoming." As the industrialist is the man who, at peril of his future livelihood, must provide the money to implement the politicians' promises, there is little wonder that he is looking rather closely at the conditions that will exist after the war to see whether his trade can be extended and his profits maintained.

Among all our industries we have for many years regarded cotton, one of the great staple industries of the country, as outstandingly efficient. A Cotton Mission has lately visited the United States, and its report has given urgency to the need for early answers to the whole series of questions raised by the problem of re-equipment. The Mission did not go into the question of the expenditure entailed by a cotton re-equipment programme of the size which would raise the productivity of Lancashire to the United States level: this was outside its terms of reference. Nor did it go into the question, far more immediately important than this, of how soon such a programme could be implemented. On the first point it has been said that the cost involved would be several times the figure of £43,000,000, at pre-war prices, which the Post-War Committee of the Cotton Board said the industry was ready to spend on new plant in the first five years after the war. The highlight of the report is that, in the 30 years before the war, efficiency as measured by production per man-hour increased by about one-half in America, while in Lancashire it remained more or less stationary. Unless there is a complete reorganisation of the structure of the British cotton industry, the gradual decline which has been so noticeable a feature of British economy in the last two decades will continue.

But, as a writer has recently pointed out, cotton is not by any means the only British industry where the rate of productivity is below that of its counterpart in the United States. The re-equipment needs of at least one other major industry, reckoned simply in terms of "modernisation," have been put at anything up to

On Other Pages

£150,000,000. Multiply amounts of this order several times to cover the whole of the industry and the costs of raising the average production per man-hour in Great Britain to the United States average would easily run into ten figures. Add to this the normal repairs and renewals necessitated by war restrictions and shortages, the demand of industry for retooling, and the continuing expenditure which will be required to keep abreast of the times—and the revitalisation of British industry can be seen to be truly a vast undertaking.

There is little doubt that we have much leeway to make up: America, Canada, and Sweden—not to mention Germany—have overtaken this country in the past 25 years. The report of the cotton mission; the contents of the report, as yet unpublished, of the American engineers on British coalmining; the complaints of the motor-car industry regarding the high cost of steel; the personal experiences of those who have been in a position to study American production methods—all point in the same direction. Professor Postan in a recent paper to the Institute of Production Engineers has given statistical confirmation, if it were needed. After the last war British engineering industry was well equipped relatively. But, it has been said, with the slump of 1921, the control passed largely into the hands of lawyers and accountants whose only aim was to write down assets sufficiently to enable dividends to be paid. If the Government policy after this war avoids a slump; if those who can understand will cross the Atlantic to see what can be done in matters of design and production; and if the workers can perceive that greater production can easily mean greater comforts and a wider life, we should have a good chance of survival.

Where does the chemical industry stand in all this? Is its productivity as high as it could be? Is there unnecessary waste of plant and man-power, and (by reason of old-fashioned processes) is production per man-hour checked? The conditions necessary for high production can be seen from the cotton report. One industry may well learn from another, and we have not hesitated to quote here the views of many writers who have recently studied this important subject. It has been said that in the cotton industry, "the crux of the long-term problem is the reorganisation of the selling end of the industry. Economies in spinning, weaving, converting—all depend on standard lines and long runs. Lancashire cannot be efficient if solely fed with millions of small orders." What of the chemical industry? Can we see sufficient volume of *bulk* orders to allow of the mass production that will be essential if high productivity is to be attained and maintained? Have we the plants which will enable the economies of bulk production to be secured? It is a problem partly in marketing and partly in the power of the Government to create such conditions throughout the world as will encourage bulk purchasing of our produce.

The cotton industry has a problem that does not concern the chemical industry—as yet. It has been said that the problems of the cotton industry are not made any less by the textile machinery makers' merger, which constitutes a virtual monopoly. This monopoly, in conjunction with tariffs on imported machinery, appears to prohibit alternative sources of supply. Prices are between two and three times what they were before the war, and those who contemplate new machinery are disturbed to learn that it will cost over five times as much to-day as the figures to which the bulk of the existing British spinning plant has now been written down. It is a difficulty paralleled in many industries where low "written-down" capital values are held to excuse inefficiency of the plant. Industry is not blind to the fact that plant and machine efficiency must be improved. The chemical industry, too, is well aware of the need for new plant. The essential difficulty here is that the Government departments have not encouraged chemical plant makers during the war and have left us to the mercy of the foreign maker of chemical plant. British chemical plant makers are skilled, but lack the experience of many of those abroad. Some foreign countries will find it undesirable to part with the experience necessary to set up new industries here for the sake of orders for chemical plant. In the chemical industry it is supremely necessary that manufacturers should be backed by a strong plant industry. That is one of the lessons we have still to learn.

NOTES AND COMMENTS

The Scientist in the Council

PROFESSOR A. V. HILL'S decision not to stand for Parliament at the next general election is a matter for regret in the world of science, but his reasons for this step are such that we can hardly expect him to reverse it. In his address in October to the Society of Chemical Industry he indicated that, in his opinion, the political forum was no place for an honest scientist; and now, in a letter to *The Times*, he has expressed himself more forcibly on the subject. Referring to "the growing trend to irresponsible partisanship and reckless recrimination," he contends that scientific men can make but a small contribution to British politics, and that the dispassionate methods of science are "a poor training for the impending political cat-fight."

A Politician's Reply

THESE aspersions on current political methods provoked an answer from Lord Brabazon, who, evidently on the principle that attack is the best method of defence, cites (without naming them) certain "aristocrats of science . . . who scream their extreme bigoted party shibboleths abroad on every occasion and even use their great names to mix political propaganda in their so-called popular writings on science." He also speaks of having noticed a pharisaic priggishness creeping into the scientific world. He does admit, however, that the majority of scientists are decent citizens hunting for the truth—and we hope they will be duly grateful for this kindly pat-on-the-back. Professor Hill's point, however, is evidently that there is no room to-day in politics for just the type of scientific man of whom Lord Brabazon approves; and this point remains unanswered. Dr. Hill has done an unpalatable job nobly, and deserves a rest; but there is still something in Sir Robert Watson Watt's request (made in his recent address to the A.Sc.W. on "Freedoms of Science") that "those who are still rightly devoted to the laboratory bench and rightly distrustful of the Committee Room and the Council Chamber should be dragged, . . . more frequently than they like, from the bench to participate in the upper councils."

Part-Time Education

IN view of the announcement which we made last week concerning the Dunlop scheme of cash awards for success as a result of part-time education, it is interesting to study the answers from the chemical industry to the questionnaire issued by the Association of Scientific Workers, which aimed at discovering opinions on certain fundamental problems relating to part-time technological education. It is a feather in the cap of the chemical industry that the largest number of replies was received from their section (the other three sections represented Government establishments, metallurgy, and engineering). The 51 answers received from the chemists covered some 4060 people, and there follows here a commentary on the gist of their replies.

Better Liaison Wanted

A GOOD point was made, in some replies, about the poor liaison between local technical colleges, and one reply is worth quoting at some length: "Too many persons in small groups or as individuals fail to get training because the technical college concerned cannot provide a class or course for only a small number, and as there is no liaison between these people, industry, and technical colleges, no provision is made to enrol them collectively." Other replies mentioned inter-college rivalry and stressed the need for co-operation in the provision of specialised courses. A second point, indicating a new trend in the chemical industry, is the establishment by three firms of Education Advisory Committees with fairly wide terms of reference. Two of these were set up on the initiative of members of the Association and were more fully discussed later in the report. On the whole it can be said that the chemical industry is alive to the importance of continued education in the majority of cases and suffers principally from the lack of any real plan as to how this encouragement can best be directed.

Inducement and Opportunity

IT has been ascertained, for example, that seven firms provide some educational facilities on the premises, although of a fairly elementary nature such as weekly lectures on scientific topics. The number of firms allowing time off with pay is 38 (74.5 per cent.); two firms allow time off only when it can be made up, while the remainder do not allow time off. Sixteen firms pay full school fees, and nine firms pay half-fees or more: seven pay all fares and two more pay half-fares, four pay examination fees, five pay for text-books, and five provide other inducements in the shape of prizes or bonuses. Of the groups which replied, 46 had a local technical college available, although there were numerous complaints about the low standard of such colleges and the impossibility of progressing beyond a certain standard. Twenty-five places had colleges which provided courses up to degree standard and, since most of the industries concerned are located in old-established industrial areas, this figure is rather low, especially if the replies from the London area are omitted, when the percentage of places providing degree courses falls from 55 per cent. to 27.5 per cent.

Hope for the North-East

IN June, 1929, there were 100,000 unemployed in the North-Eastern area of England; in June, 1938, 134,000. Over a period of eight years, the numbers engaged in the two principal industries, coal-mining and shipbuilding with marine engineering, had declined by some 70,000. It is not unreasonable to suggest, therefore, that it would be a good idea to find employment in that area for some 130,000 workers after the war. A survey of the possibilities has been made by the Newcastle-upon-Tyne branch of the Association of Scientific Workers, and is published, price 3d., under the title *Hope for the North-East.* As would be expected in a coal-producing district, a considerable expansion of the chemical industry in the area is envisaged. At present, chemicals cannot be regarded as more than a minor industry in the district; but there are good reasons why they should form the basis of a very much larger enterprise, especially if linked, as is indeed proposed, with a power industry. The linkage of chemicals with oil is an example of the close connection between the two branches of industry, and there is much to be said for the establishment of a local oil-refining industry somewhere near Tyneside; experience has shown that the refinery products will not compete with the products from coal. In any case, work is now going on which should add many new by-products to those which are already produced from Northumbrian and Durham coal. We have described in this journal the work of Professor Riley of Newcastle on the problem of making coking coals from non-coking coals—one road to the greater availability of by-products.

A Long-Term Programme

ANOTHER step towards the large-scale production of heavy chemicals would be the expansion of the local gas-producing industries, with a special eye on the possibilities of ethylene and acetylene. In quite other directions, there is the local magnesian limestone ready as raw material for magnesium, if cheap ferrosilicon or cheap electric power could be made available (as is, in fact, possible). Such commodities as cellular concrete, foamed slag, wood-wool cement blocks, and other insulating building materials are suggested as suitable manufactures for the area; and attention is drawn to the coastal seaweeds and the improvement of the Tyne sewage system as potential sources of wealth. This is a long-term programme, and it has not been forgotten that it takes technologists to convert raw materials into chemical wealth. In this connection, therefore, is made the interesting recommendation of the establishment of a School of Carbon Technology and a Department of Chemical Engineering at the local university, so as to provide the 5000 chemists, physicists, and chemical engineers requisite for the development of a five-year plan such as is outlined above. Whatever may become of it, the plan is constructive, and should set the North-East thinking along the right lines; the £5,000,000 which it is proposed to spend on research, over five years, might well be recouped before a much longer period shall have passed.

The Netherlands Chemical Industry

Rapid Expansion before the War

THE mineral wealth of the Netherlands—and in this respect they differ from most other industrial countries in Western Europe—consists solely of coal and salt. It is, therefore, all the more remarkable that industry should rank foremost in the country's economic life and that it should be responsible for a substantial part of its exports. Up to 50 years ago manufacturing industries were of small account. They began to develop rapidly about 1870, and especially since the last war, when about 40 per cent. of the population were employed in industry against 20 per cent. in agriculture, and 22 per cent. in trade and commerce. This development proves that the position as regards raw materials is less unfavourable than might appear at first sight.

The country relies, in the first place, on farm produce, on which processing and secondary industries are based. In many cases raw materials, forming the basis of manufacturing industries, are supplied by the Netherlands East and West Indies.

The shortage of domestic raw materials made itself principally felt in respect of minerals, but the absence of basic industrial material has not prevented a rapid and steady industrial development. In particular, the favourable geographical position of the Netherlands greatly enhanced the growth of such industries as processed raw materials other than those of agricultural origin; in addition, it also gave rise to an important entrepôt trade and, from the warehouses in the ports, raw materials and tropical products of every description were sent to all parts of Europe.

Main Groups of Industry

The first main group of industries, devoted to processing farm products, does not, at first sight, appear to be as important as it actually is, on account of the relatively small number of people engaged. This group includes the dairy industry, the beet-sugar industry, the manufacture of strawboard and starch products, the canning industry and others. They are distributed throughout the country, with the exception of the strawboard and potato products industries, which are confined to the north, and the beet-sugar industries which are mainly found in the south-west. The western part of North Brabant, where sugar beet is extensively grown, has several large refineries; there are others at Halfweg, near the great polder of the Haarlemmermeer, and also in the Frisian city of Groningen, both of which are in sugar-beet-growing regions. Some alcohol distilleries are also established in these places. Paper making—a "classical" Dutch industry—is active at Velsen in North Holland (van Gelder's factory), in the Veluwe district of Gelderland, and along the Maas in North Brabant.

A second group of industries is formed by those processing imported raw materials. They include some of the oldest branches and are closely associated with the colonial products market of Amsterdam, and the transit trade centring round Rotterdam. The rice-hulling mills and oil mills on the River Zaan, north of Amsterdam, and the oil mills, margarine factories and quinine works at Amsterdam itself are notable examples. The growth of the oleo-margarine industry is a striking example of the country's enterprise. The main factories, at Rotterdam, Oss, and Nijmegen, produced for the home market: markets in Belgium, Germany and elsewhere received supplies from local factories, belonging to the Dutch interests of the well-known Unilever group.

The chemical industry in the Netherlands was small before the last war, but it grew rapidly afterwards. The intensive pursuit of agriculture called for large quantities of chemical fertilisers, which were originally imported. Three large plants for nitrogenous fertilisers were built in the 1930's at Ymuiden, at Lutterade (near the Limburg coal mines), and at Sluiskil, in Zeeland. Rock phosphates were imported from North Africa and South America, and potash from France and Germany.

Basic Chemicals

The size of the chemical industry in any country can well be measured by the production of sulphuric acid in that country. In 1938, Holland had a production of 385,000 tons of sulphuric acid calculated as SO_3. About 55 per cent. was used in the manufacture of superphosphate, for which nearly 400,000 tons of phosphate rock were imported every year. Roughly 35 per cent. of the sulphuric acid produced was needed for the manufacture of ammonium sulphate. It can easily be understood why, in an agricultural country like Holland, such a large percentage of this basic chemical was required in the fertiliser industry, since not only did home needs have to be supplied, but also a successful export market had been built up, absorbing some 365,000 tons of superphosphate per annum.

The next important basic chemical is caustic soda, and the way in which Dutch enterprise, in a few years, succeeded in making Holland largely independent of outside supplies is illustrated by the fact that,

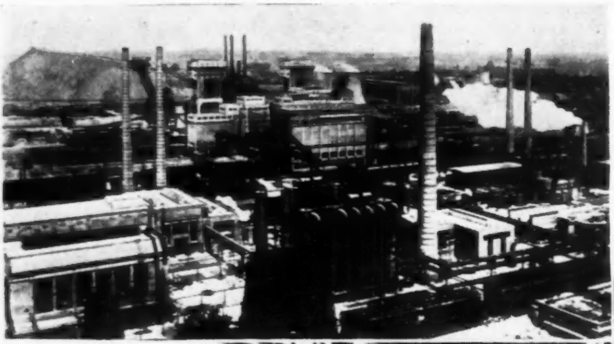
in 1930, production of caustic soda was nil; whereas in 1940 it amounted to 12,000 tons yearly—about 60 per cent. of the home demand. Taking another basic product, sodium hypochlorite, in 1930 production was insignificant; ten years later it covered domestic requirements.

In the dyestuffs field, aniline dyes (largely sulphur dyestuffs) were made at Vondelingenplaat, near Rotterdam, while blue pigments of the ultramarine type were manufactured at Sas van Gent and at Zaandam. At the same time a rising demand for dyestuffs resulted in a steady increase in imports. At Dordrecht a company, using the Bucher process, manufactured cyanides and prussiates.

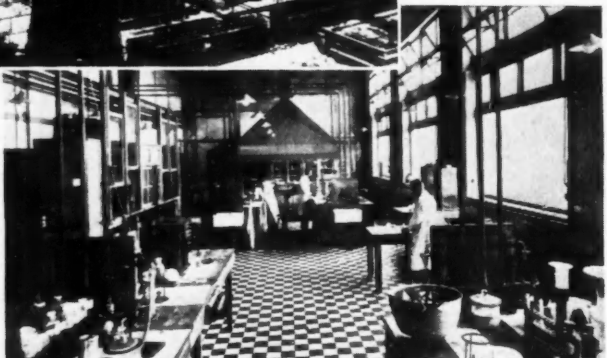
An important export item was quinine, produced from Java cinchona bark, in which the Netherlands, together with the Dutch East Indies, had almost a world monopoly. Essential oils were produced at Zaandam and Naarden, and certain pharmaceuticals at Oss. The rayon industry started its great expansion about 1922; important factories were built at Ede, Arnhem, Breda, and Nijmegen, of which the first two belong to the Algemeene Kunstzijde Unie (A.K.U.).

Holland is self-supporting for roughly half its needs of cement, in paints and varnishes, and in soap and matches. The yearly production of paints and varnishes was roughly 42,000 tons before the war, which approximately corresponded to home consumption. This industry was aided by the fact that Holland has a larger production *per capita* per annum of linseed oil than any other country in the world.

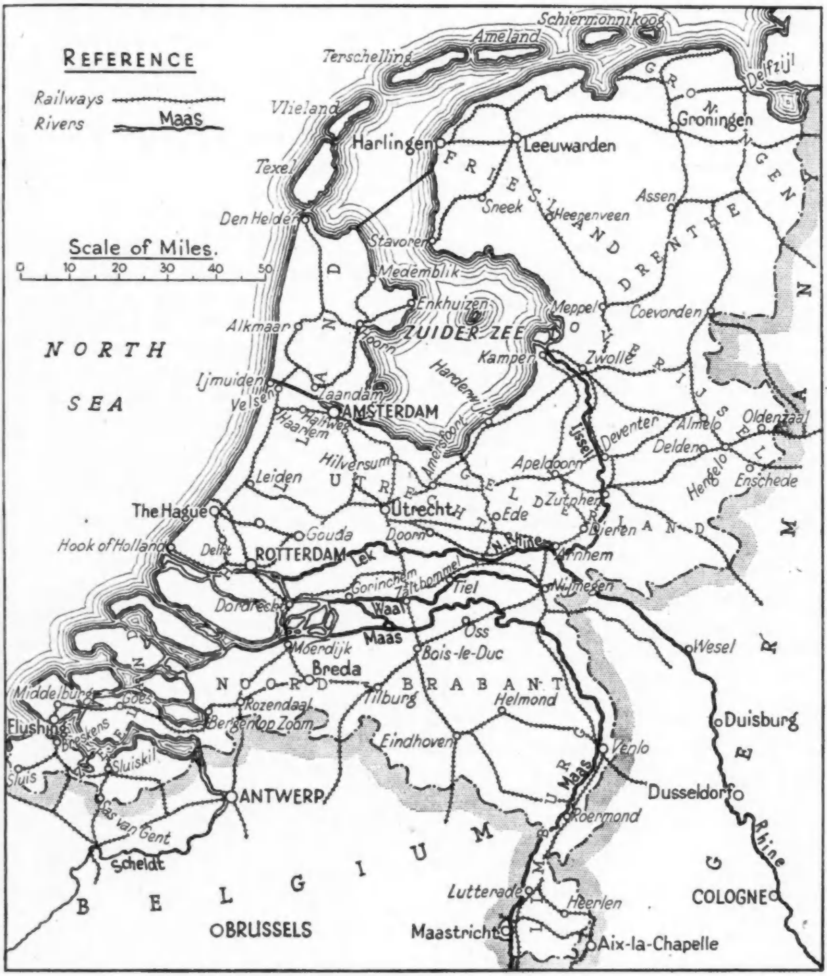
Coal has been mined, up to the present, only in the Limburg hills, at the edge of the great European coal field, which extends from Valenciennes, in the North of France, to the Ruhr Valley in Germany. The Dutch mining industry was mainly developed by the Government and had reached a high level of efficiency. A recent pamphlet issued by the Fabian Society, entitled *The Dutch State Coal Mines: What Government Administration has Achieved,* deals with this subject *in extenso.* One of the mines, the Maurits mine, is among the most productive in Europe. Almost ideal social conditions and the highest possible degree of mechanisation resulted in the highest output per miner of all European countries. In 1939, output totalled 65,000,000 tons and 40,000 people found employment. As the reserves of the southern Limburg coal-measures are limited, other deposits, in the



Dutch State coal mines, where ideal social conditions and mechanisation result in highest output per miner in Europe.



The chemical laboratory of the Philips Works at Eindhoven has aided developments in telecommunication.



vicinity of Roermond, are to be exploited. Another equally successful Government enterprise was the production of salt at Boekelo, near Enschede, adjoining the textile-manufacturing district of De Twente. Home-produced salt completely replaced the Portuguese salt which formerly dominated the Dutch market. It is not gained by mining, but by dissolving with water in bore-holes. Salt works and six smaller boilers for the production of table salt are operated by the Nederlandsche Zoutindustrie. A growing alkali industry is developing, based upon these salt deposits.

In the metal industry the Netherlands are handicapped by the lack of raw materials; nevertheless, there are blast furnaces both near Velsen and at Ymuiden on the North Sea Canal, and steel works at Utrecht. In a class by itself stands the Philips works at Eindhoven, world-famous both for its output of electrical material and for its pioneer work in telecommunication. In the development of the products made here, chemistry has played no small part, and the laboratories were a model of efficiency.

Although Holland's chemical industry is not of the greatest importance, her contri-

bution to chemical science was always on a high level. The best-known chemical periodicals published in Holland are the *Recueil des Travaux Chimiques des Pays-Bas*, founded in 1882, originally edited exclusively in French, but later in English, French, and German, and the *Chemisch Weekblad*, which was started in 1903 as the official organ of the Dutch Chemical Society. A number of chemical contributions also appear in the *Proceedings of the Royal Society of Sciences*, printed in Dutch, English, French, and German.

Holland's contributions to applied chemistry, with the possible exception of the products of the Philips works, are little known abroad. It is significant that a country with 9,200,000 inhabitants, with three State Universities (Leyden, founded in 1575, Groningen in 1614, and Utrecht in 1636), has only one Technological University (at Delft). This was organised in 1905 as the successor of the State Institute of Technology of the same city, founded in 1842. Nobel prizes have been awarded for outstanding achievements in chemistry to van't Hoff (1901), who was the first Nobel laureate in chemistry, and for physics to Debye in 1936. Among other eminent Dutch chemists may be mentioned Bakhuis Roozeboom, van Bemmelen, and Holleman.

A Silver Jubilee

Cooper, McDougall and Robertson

THIS year the firm of Cooper, McDougall & Robertson, Ltd., manufacturers of sheep and cattle dips, livestock and dog remedies, disinfectants and soaps, etc., celebrates its 25th birthday. Registered privately in January, 1920, for the purpose of acquiring the business of William Cooper & Nephews (established in 1843), the company acquired the undertakings of McDougall & Robertson, Ltd., and McDougall & Yalding, Ltd., in 1925; it also directly controls Morris, Little & Son, Ltd. Jointly with I.C.I. Ltd., the company owns all the capital of Plant Protection Ltd., its own authorised capital being £1,800,000, of which a total of £1,571,886 is in issue.

The last accounts published covered the 15 months' operations to December, 1943, and disclosed gross earnings amounting to £286,415, and, after debiting £174,284 to taxation and charging pensions and deferred repairs, the balance of net profit was £90,550. This compares with £87,266 for the previous year, and enabled the directors to pay a divident of 6¼ per cent. for the period on the ordinary capital, equivalent to 5 per cent. per annum, and to allocate the sum of £25,000 for additional property depreciation, as against £30,000 previously. This leaves a credit balance of £54,269 to go forward to the next account, as against the sum of £54,513 brought in.

Science in Industry

British Association Conference

FURTHER details are now available about the conference arranged by the British Association on "The Place of Science in Industry," the time and place of which have been announced in our "Forthcoming Events" column. The conference aims at giving a picture of the various ways in which scientific research is being applied in industry and of its significance in the future. In this way the Association is continuing its policy of promoting the discussion of those aspects of science of special importance in post-war reconstruction, which emerged during the conference on "Science and World Order" held in September, 1941.

The full programme of the four sessions follows hereunder; discussions will take place at the conclusion of each session.

Session 1. January 12, 10 a.m.

What Industry Owes to Science

Chairman—The Rt. Hon. Ernest Bevin, P.C., M.P.

Sir Richard Gregory, Bt., F.R.S., President of the Association: Opening Address.

The Rt. Hon. Lord Brabazon, P.C.: Aviation.

Sir Robert Watson-Watt, F.R.S.: Telecommunication.

Professor W. T. Astbury, F.R.S.: Synthetic Fibres.

Professor J. D. Bernal, F.R.S.: Summing-up.

Session 2. January 12, 2.30 p.m.

Fundamental Research in Industry

Chairman—The Rt. Hon. Lord McGowan, K.B.E.

Professor P. M. S. Blackett, F.R.S.: Physics.

Professor E. C. Dodds, F.R.S.: Chemistry.

Dr. C. D. Darlington, F.R.S.: Biology.

Dr. D. P. Riley: X-rays.

Session 3. January 13, 10 a.m.

Industrial Research and Development

Chairman—Sir John Greenly, K.C.M.G.

Dr. C. Sykes, F.R.S.: Metallurgy.

Dr. S. G. Hooker: Development of the Merlin Engine.

Mr. W. C. Devereux: Research and Development applied to Light Alloys.

Mr. J. C. Swallow: Plastics.

Mr. A. L. Bacharach: Synthetic Vitamin Industry.

Session 4. January 13, 2.30 p.m.

The Future: What Science might Accomplish

Chairman—The Rt. Hon. Lord Woolton, P.C., C.H.

Mr. E. Carter: Housing.

Sir Joseph Barcroft, F.R.S.: Food.

Professor J. M. Mackintosh: Health.

Sir Lawrence Bragg, F.R.S.: General Survey of the Future.

Sir Harold Hartley, F.R.S.: Summing-up.

New Chemical Apparatus

Portable Vacuum Pump

A COMPACT portable unit for the production of high vacua, suitable for general laboratory use, is the newly designed High Vacuum Pumping Unit, produced by J. W. Towers & Co., Ltd., Widnes. The unit, as illustrated herewith (Fig. 1), was specially designed by A. R. Gilson to meet the requirements of the organic and physical chemist, and when used with a satisfactory backing-pump, readily achieves a vacuum of the order of 10^{-6} mm. of mercury.

It incorporates a quartz three-stage mercury vapour diffusion pump of robust design, a short form double McLeod gauge, two traps for cooling with solid CO_2 or liquid air, a drying vessel to be packed with P_2O_5 or silica gel for safeguarding the fore-pump, a simple differential manometer, and the necessary high vacuum stopcocks. The whole is mounted on a stainless steel framework bolted to a heavy hard asbestos base board. Provision is made for the convenient attachment of forevacuum, auxiliary vacuum for the McLeod gauge, and the diffusion pump cooling water. The McLeod gauge ranges from 10^{-6} to approximately 1.2 mm. of mercury; the exact value of the upper limit varies with each gauge, depending on the dimensions of the capillaries.

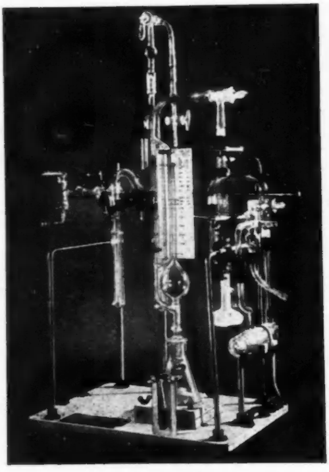


Fig. 1.

Advantages claimed by the makers for this unit are: (1) High pumping speed is assured by the use of wide-bore Pyrex glass tubing which at the same time ensures adequate mechanical strength; (2) the all-glass construction permits of ready observation, eliminates corrosion, and simplifies the removal of accidental and incidental contamination—a common source of trouble with metal pumping systems, particularly when used in the organic laboratory; (3) standard ground joints are used throughout, certain of them being suitably disposed to facilitate dismantling and cleaning.

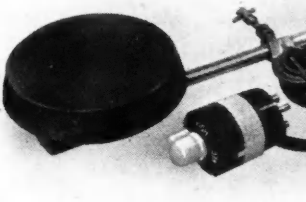


Fig. 2.

Portable Hot-Plate

The same firm has also just produced a convenient laboratory hot-plate (Fig. 2), which is stated to be flame-proof and drip-proof, has a compact switch-plug unit, and is economical in operation.

It is fitted with a 400-watt three-heat embedded element and incorporates a polished heat reflector mounted on the underside in a non-conducting hard asbestos casing. The heat is concentrated in the right place and consequently a low wattage element suffices for all general laboratory purposes. A novel three-heat switch plug unit (B.E.S.A. Standard 3-pin plug 5 amp.) is provided which is very compact and removes the three-heat switch from the hot-plate itself. The sloping sides ensure that any liquid on the plate does not come in contact with the heating element or electrical connections. The support rod is a stainless steel tube through which passes the four-core electric cable. An aluminium-bronze die-cast bosshead is supplied for mounting on a retort stand or other fitting.

Improved Fugitometer

The K.B.B. Fugitometer, made by Kelvin, Bottomley & Baird, Ltd., Kelvin Works, Hillington, Glasgow, has been recently re-designed on an improved model (Fig. 3), in collaboration with the Wool Industries Research Association. Basically, the instrument comprises a revolving drum which carries the samples under test

in special holders. These sample holders are suspended from the top of the revolving drum in a constant upward stream of air conditioned to a predetermined humidity and temperature. This is assured by a horizontal fan which rotates just above the level of the humidifying water in a circular

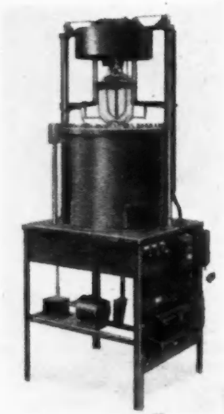
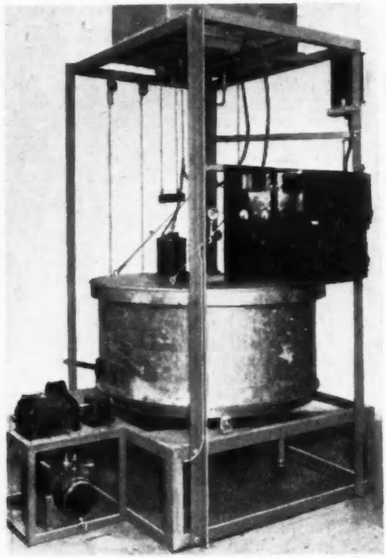


Fig. 3 (left)

Fig. 4 (right)



tray at table level. The temperature of this water is controlled by immersion heaters with thermostatic control.

The source of fading radiation is the standard carbon arc lamp, retained from previous designs of the Fugitometer. On comparison of the spectrum of the Fugitometer lamp with that of sunlight there is a very close resemblance—particularly at the violet end of the spectrum—and because of the steady and intensive light impinging on the samples under test the period of time required to produce results comparable with sunlight is substantially reduced.

When being used on exposure tests, the heat from the lamp is shielded from the two samples and is absorbed by water contained between the walls of two concentric glass cylinders. This water is cold, is in constant circulation and rises to a predetermined level in the glass cylinders. When this level is reached, the surplus overflows into the baffle cone, above the fan, which is thus kept cool and prevents any further heating of the conditioned air. The surplus water from this baffle overflows from its outlet into a small compartment in the main humidifying tray. This compartment is for maintaining the water level in the main humidifying tray at a constant level, and also for preventing any mixture of the heated water in the main tray with cold water from the cylinders.

Supplied with each instrument is a neat self-contained hygrometry unit comprising "wet" and "dry" bulb thermometers with water container for quickly establishing the relative humidity of the conditioned air at any time.

The K.B.B. Paint Testing Outfit, Camouflage Paint type, is made by the same firm in accordance with B.S.S. 987-1942. It provides facilities for exposing painted sample panels to radiation from a carbon arc lamp and also to a water spray. The sample panels are set on the inner wall of a metal cylinder which is revolved through gearing at about three revolutions per hour. The samples pass eccentrically round the arc lamp and at one part of the revolution come under a water spray.

The outfit (Fig. 4) comprises: (1) Revolving drum 4 ft. diameter with cover arranged for suspension, timber platform, driving motor, and gear box, also air pump and an enclosed carbon arc lamp arranged for suspension, also a spray nozzle. (2) Control gear: wall panel carrying D.P. switch and fuses for arc lamp and driving motor, also starting resistance for arc lamp where required, and choking coil (for A.C.) or line resistance (for D.C.). (3) Two winches and eight fairlead pulleys for raising and lowering the lamp and drum cover, with 50 ft. of flexible steel suspension wire. The following accessories are also supplied: air reservoir with relief valve and pressure gauge; 50 carbons of type varied to suit current; spare glass cylinder and carbon cutter. It is essential to state voltage and frequency with alternating current, and voltage with direct current.

Metallurgical Section

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January 6, 1945

Selenium Recovery

Its Development in Metallurgical Processes

by A. G. AREND

SELENIUM has enjoyed a very fluctuating popularity since its discovery more than a century ago. It was long regarded as an undesirable element and, although later widely in demand for the making of photoelectric cells, it had to meet competition from thallium and caesium for this purpose. During the last war it was thrown out as waste and, at an even later date, it was frequently roasted-off from different metallurgical products as its recovery was considered to be too complicated to be worth while.

In order to understand the position it holds as a raw material in industry, the consumption of iron pyrites and of regular metal-winning ores has to be compared, with due attention to conditions in the countries involved. There is no easy way of estimating the total selenium available in the world. Ore smelting in this country, for example, does not involve great tonnages, but sulphur tonnage is enormous. In the U.S.A., however, the opposite state of affairs exists; more ore smelting is performed there than in any other part of the world, while the direct burning of pyrites is on a much smaller scale, as so much sulphur is emitted during these smelting processes.

As a general rule the total quantity of selenium in the raw material amounts only to a few points per cent., and frequently to very much less, and, as a consequence, it is rarely estimated in the original ore or pyrites. The flue dusts which accumulate in sulphuric acid and alkali works, and in metallurgical smelters, are almost invariably examined for this constituent. Interest in the selenium present in chamber muds and at other points in the acid factory diminished when much larger sources were opened up in metallurgical works; in the latter the nature of the system lent itself favourably to extraction, and the percentage recovered was much higher. Thus, on the one hand, the acid deposits were small and involved a separate process, whereas, on the other, the flue dusts and anode slimes from metal refining were relatively large, and were dealt with in any case as a regular routine.

It is doubtful whether selenium extraction is carried out on exactly the same lines in any two works. Although tellurium is usually associated with selenium, its behaviour differs in the earlier stages of recovery in that it does not possess the same volatility and is much more liable to enter the furnace slags. Most of the earlier efforts were concentrated on getting rid of selenium as completely as possible. Roasting was performed slowly, with small amounts of sulphuric acid present to assist it to pass up the flues. This practice was continued up to 1939 with certain Australian concentrates containing precious metals, and also with bismuth ores, etc.

Initial Extraction

In wet metallurgical works where copper, lead, silver, etc., are recovered, selenium is almost completely passed to the condensing towers where chloridising roasting is carried out. As these towers are operated on the Gay-Lussac principle, the gases are absorbed in water which trickles downwards over coke and, in the form of dilute acid, is later utilised for the wet extraction. Selenium is reduced alike by the carbon monoxide and the sulphur dioxide in the gases, but in view of its small proportion it tends to remain suspended in the acid liquors which flow from the bottom of the towers.

As minute proportions of both gold and silver are likewise carried by this liquor, a stream of dilute sodium sulphide is added, or the liquor is made to pass over pieces of ferrous sulphide. The hydrogen sulphide so formed precipitates any copper and lead which may be present, and forms a nucleus for collecting the suspended rarer constituents. The liquors pass around a set of settling boxes before passing to the large storage bin, whence the acid is tapped off as required. The dark brown mud containing the selenium is allowed to collect, and is removed at vacation periods. It is dried slowly in ovens, care being taken that no "dusting" occurs; it is then packed in bags and despatched to the precious-metal refinery. When copper is extracted by the foregoing system, even though no final

electrolytic refining is applied, the smelted metal rarely, if ever, contains selenium.

The process differs materially from the practice where copper is smelted in the blast-furnace, passed to the converters and finally electrolysed, since although the majority of the selenium passes to the flues, a certain proportion is always retained in the metal and is eventually accumulated in the anode slimes. Anode slimes from other base-metal processes likewise retain the selenium, but, as most of these also contain silver, they are collected and passed to the precious-metal department. Accordingly, the bulk of the selenium from all sources eventually reaches the one point. On a smaller scale, the different concentrates containing gold and silver are a direct source of selenium-enriched anode slimes. For example, although the original ores contain only a few points per cent. of selenium at the most, the Raritan refinery was enabled to recover as much as 3000 lb. of the powdered material per month, which represents one of the world's largest outputs.

In order to ensure as complete a recovery as possible of the different metals, the process is a little complicated, and in this respect differs from the more direct treatment of chamber muds and lead deposits from sulphuric acid production. All that has to be done with the latter is to digest the mass in solvent liquors such as 50° Bé. sulphuric acid, prepared hydrochloric acid, or in some cases *aqua regia* for rich deposits, and eventually to precipitate the selenium by sulphur dioxide. Although this involves a number of evaporations, the extraction is more or less direct and simple, and the same applies when reddish mud obtained from hydrochloric acid receivers is dealt with.

With anode slimes, on the contrary, there is much copper to contend with, besides arsenic, iron, lead, antimony and other impurities. From the anode slimes from the Moebius and Balbach-Thum processes the impurities, if anything, tend to a still greater variety, as tin, nickel, and zinc also make their appearance. The vast bulk is represented by copper itself; however, as solid particles of this metal find their way from the electrodes into the deposit, the first and main object is to get rid of this copper.

Treatment of the Slimes

The anode slimes are removed wet from the electrolytic tanks and are placed in capacious settling tanks, where they are repeatedly washed with hot water until the final washings show no reaction when tested with ammonium hydrate. The need for this will be better understood when the large tonnage handled is considered, as these washings go back to be enriched with fresh acid for electrolysis in the regular refinery. A continuous type of rotary vacuum filter is utilised at this point with a cord-scraping device attached so that both filtrate and cake are removed non-stop. This slime cake, generally dark-brown in colour, is first dried and then passed into an oil-fired roasting hearth, where oxidation is allowed

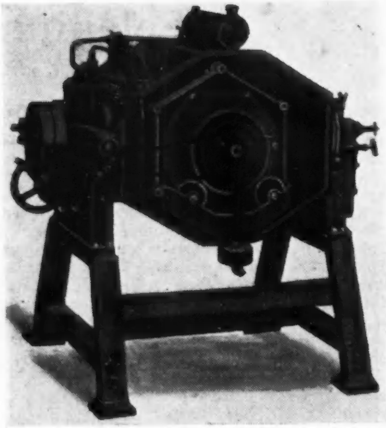

Fig. 1. Mill and rotary roaster used in earlier years to eliminate as much selenium as possible.

to take place at 370° C. The roasted mass is then allowed to travel into a leaching tank in a slow stream, while the contents of the tank are circulated by wooden paddles. A solution of 15 per cent. sulphuric acid is used, the agitation continued, and the temperature raised to boiling point. This is carried on until a test of the solid matter reveals that it is free from insoluble copper. Where the liquor is free from minute quantities of tin, which sometimes appear, it is exposed to the action of copper plates to deposit any antimony, arsenic, etc., which may remain in solution. This is done in a large open bin maintained at boiling point by steam coils, and, afterwards, instead of being returned to the electrolysis tanks, the liquor is utilised for the making of copper sulphate.

Where the refinery has a large surplus stock of copper, the practice is sometimes varied by converting part of this copper to shot condition. This is housed in a tall cylindrically-shaped tower, down which the liquor is passed, whereby it is enriched, thus necessitating less evaporation.

Compared with the larger base-metal operations, the tank capacities for this work are relatively small; in one case, the stirring tank had a capacity of some 700 gallons, the precipitator tank with the copper plates a capacity of 740 gallons, and

the evaporator tank 1200 gallons, while crystallisation was effected in 300-gallon lead-lined tanks. The special rotary vacuum filter with cord attachment discharges the copper-free slimes continuously into trucks, which are wheeled away to the furnaces where other purer slime deposits are worked. The flux used at this point comprises a mixture approximating to 75 per cent. sodium carbonate and 25 per cent. sodium nitrate, which is first intimately incorporated in the clean slimes before charging. Oil-firing is again to be preferred to gas-firing, for the small reverberatory furnace, and fusion is performed at a dull red heat.

The alkaline slag so obtained contains the bulk of the selenium, and nearly the entire tellurium content if properly worked, but the process is only temporarily stopped at this stage to clean off the slag. Where the process happens to be chiefly concerned with tellurium, every attention is paid to the condition and disposition of the slag at this point, but this is not so important with selenium because any remains are completely expelled by the introduction of a strong current of air. When the alkaline slag has been removed as completely as possible, the temperature is raised to a bright red heat, and a compressor delivers this air, which causes the antimonial lead alloy to appear to boil violently. By so doing, much of the antimony is oxidised and is later removed from the surface, while the selenium remaining passes almost completely to the flues.

What is known as the antimony-lead slag is despatched to the refinery where type metals, etc., are made. The flue gases are first cooled and the solid matter allowed to settle out, after which they pass through

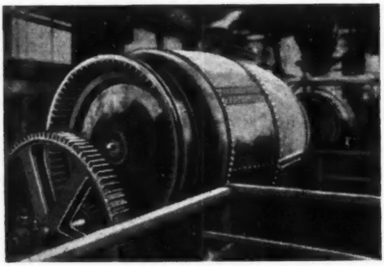

Fig. 2. To-day, oil-fired furnaces are adapted to conserve and recover the maximum amount of selenium. The above shows such a furnace, used for the fusion operation.

scrubber towers, where re-circulated water carries down the solid matter in the form of a sludge. The gases then pass on to a Cottrell precipitator, but most of the selenium in the form of selenous oxide is obtained in the previous sludge. This is

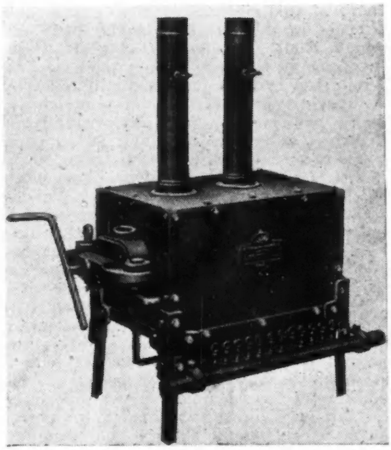

Fig. 3. Type of Fletcher-Russell furnace selected for testing selenium products.

added to the product from the alkaline slag. The one product is an acid one and the other is alkaline, and they are accordingly dissolved in separate leaching vats. The two liquors are then mixed according to a prearranged plan to form a neutral solution, and then boiled to separate the tellurium, which is removed by passing through a small filter-press.

The neutral solution is now exposed to the action of sulphur dioxide gas, which precipitates the selenium as a red-coloured mass; the addition of a 10 per cent. hydrochloric acid solution ensures a better separation. For the purpose of this gassing, pure sulphur from another part of the plant, which is recovered as a waste product, is burned, using a small eight-sided burner which keeps running day and night. The sulphur dioxide gas is first passed through a small water vessel, as it is desirable that no impurities should reach the selenium (which is pure at this stage), and it passes thence into a set of connected sealed cylindrical vessels.

The red or dark-brown selenium obtained after washing and filtering is carefully heated, when it melts to form a black mass. When this has been sharply cooled, although in bulk appearing as a black or purple-black mass, it can be drawn, while hot, into thin sheets, showing a fine red colour. The vitreous modification is kept for some time at a temperature of approximately 65° C.,

when it is converted to silver-grey metallic selenium, the form in which it is familiar for the production of photo-electric cells.

As is well known, the electrical conductivity of this material is greatly altered by changes in the intensity of the light with which it is illuminated. The resistance increases as the temperature increases, but diminishes with increased illumination. Although the manufacture of photo-electric cells, photometers, etc., is probably the principal outlet for selenium, owing to its world-wide application, the total weight necessitated for such purposes is very small. The employment of selenium in cancer treatment, once popular, has since, apparently, been abandoned. It is also used alone, and in conjunction with other constituents, for the colouring of glasses and in certain rubber vulcanisation processes.

Since the war, a fresh outlet has been found for selenium as an ingredient of austenitic chromium steels. For this purpose it is supplied in the form of bars of selenium-bearing stainless metal. The addition of the selenium exerts no detrimental influence on the mechanical properties of the steel, but increases its machinability and its ability to resist corrosion. Thus, a substance which was formerly largely thrown out as a waste product, and was considered to be of academic interest only, is to-day widely in demand for numerous vital purposes.

Strangely enough, since the war its presence in certain soils has become notorious, because it has been found guilty of poisoning crops and livestock, deforming the hoofs of cattle and impairing hens' eggs which otherwise would have been healthy, and it has accordingly been the subject of wide investigation by agriculturists.

Reclamation of Tin

Recent American Practice

IN an address delivered to the Tin, Tin Alloys and Tin Coatings Group of the National Metals Congress in Cleveland, Mr. W. S. Smith, vice-president of Metal and Thermit Corporation, said that in recent years detinning had been done by the use of alkaline detinning baths. Tin scrap, after proper preparation, was immersed in a hot bath of caustic soda and an oxidising agent, such as sodium nitrate, dissolving scrap in three or four hours, forming a solution of sodium stannate Na_2SnO_3. Mr. Smith went on to say: "The stannate is removed from the detinning bath either by concentration of the bath by evaporation, or by allowing the bath to become saturated, after which the stannate is precipitated as rapidly as it is formed. The precipitated stannate is dissolved in water and purified to remove undesirable metals, sand, dirt, and other materials. The dissolved stannate may then be electrolysed by the deposition of tin on the cathodes and the regeneration of the caustic combined with the tin. The cathode tin, after suitable refining, has a purity higher than that of standard grade-A tin. Some detinners produce certain amounts of extremely pure tin, 99.99 per cent., and practically all electrolytic tin produced by detinners contains 99.9 per cent. tin." A certain amount of sodium stannate is purified for sale as a chemical for tin plating and in some plants the tin is recovered by precipitating tin hydrate from a sodium stannate solution with carbon dioxide. At the present time, practically all the tin is produced as metallic tin, since use of tin chemicals is greatly restricted under the tin conservation programme.

Not only is the quality of the tin recovered from the detinning process excellent, but the steel scrap which is recovered, particularly that received from tin clippings, is also of a high grade. It is sold to the open hearth mills in hydraulically compressed billets, with a density of over 150 lb. to the cu. ft. It consists of low-sulphur, low-phosphorus, low-carbon steel scrap, with no residuals, suitable for the deep drawing requirements of can manufacture.

U.S. detinning companies recovered in one year 340,000 tons of steel and 6000 tons net of tin from the clean tin plate clippings resulting from the manufacture of cans.

ALUMINIUM RIVETING

Riveting of wrought aluminium alloys is the subject of Information Bulletin No. 8 published by the Wrought Light Alloys Development Association, Birmingham, 2. The Bulletin maintains that in spite of recent developments in joining techniques, riveting remains the principal method of joining aluminium alloy sheet. After a discussion of the correct choice of rivet alloys, identification of rivets and the types of rivets covered by B.S. 641-1935 and by the Society of British Aircraft Constructors, the manufacture of rivets is briefly dealt with. The design of riveted joints and drilling practice are covered, followed by a detailed account of riveting practice. The hot driving of the larger sizes of rivets in duralumin-type alloy, methods of rendering riveted plates pressure-tight, the correct choice of riveting tools, etc., are then described.

An important feature of the Bulletin is the attention paid to rivets for special purposes, while a special section is devoted to automatic riveting practice. The heat-treatment of aluminium-alloy rivets is discussed in an appendix, and the Bulletin is illustrated by 38 photographs, drawings and diagrams.

Acid-Resisting Steels*—II

The Welding of Chemical Plant

(*Continued from* THE CHEMICAL AGE, *December* 2, 1944, *p.* 524)

THE acid-resisting Cr-Ni steels have found their most general application in the chemical industry for plant and vessels where severe pressure requirements are called for. The high corrosion-resistance of these is attributable not only to the composition, but especially to their homogeneous austenitic structure, assumed on quenching from about 1100° C. With this structure, they are at their softest, and readily formable. As a general rule, all steels with heterogeneous structure are less tough, have a somewhat greater tensile strength, and have, either entirely or locally, less corrosion resistance to acids according to whether the texture is uniformly or locally heterogeneous. In the latter case, which can give rise to inter-crystalline corrosion, the problem is under examination. Steels with a uniformly heterogeneous microstructure have less corrosion resistance than a steel with a uniform austenitic structure, but inter-crystalline corrosion with the former structure will not be encountered (*see* Table 4).

TABLE 4
Corrosion Tests in Mixed Acids at 90°C. on Steels Nos. 5 and 6.

Steel No.	% C	% Cr	% Ni	% Ti	Texture after quenching from 1100°C. in water	Loss in weight g/m²/hr. 57% H_2SO_4 21% HNO_3 22% H_2O	Loss in weight g/m²/hr. 20% H_2SO_4 15% HNO_3 65% H_2O
5	0.06	18.7	9.4	—	Austenite	0.18	0.06
(5)	0.13	18.7	9.3	—	Austenite	0.31	0.08
6	0.06	18.4	8.9	0.3	Austenite & carbide	0.40	0.11

TABLE 5
Corrosion Tests in Sulphuric and Sulphurous Acids.

Steel No.	% C	% Cr	% Ni	% Mo	Loss in weight g/m²/hr. at 90°C. 1% Sulphuric acid	10% H_2SO_4	H_2SO_3 ∼ 2% Pressure 0.25 at (∼ 100°)
7	0.05	17.1	9.8	2.6	0.03	0.05—1	0.01
9	0.09	18.1	9.3	1.75	0.04	0.05—1	0.01
9	0.06	18.2	9.2	1.50	0.06	0.05—1.5	0.015
5	0.06	18.7	9.4	—	0.40	0.05—5	0.81

A uniform heterogeneous structure can be obtained with an 18/8 Cr-Ni stainless steel, with a carbon content of over 0.7 per cent. by a suitable heat-treatment or forming and heat-treating at a medium temperature, or else by alloying with carbide-forming elements (Ti, Ta and Nb), followed by the normal quenching from an elevated temperature.

All the acid-resisting 18/8 Cr-Ni-steels may be welded either with the electric-arc system or by autogenous welding. The result, as regards the stability of the weld-zone to inter-crystalline corrosion depends to a large extent on the welding process itself, apart from the nature of the steel itself and its condition. It may be assumed that welding of the corrosion-resistant steels will be carried out by skilled persons, so that the following remarks pertain only to the actual steel to be welded, and not to the welding process.

The first observations made on the subject of weld-decay showed that austenite with the higher carbon contents, for example, about 0.15 per cent. C, or coarse-grained austenite formed by reheating to the critical temperature, is much more inclined to inter-crystalline corrosion than a fine-grained austenite with a low carbon content. Further, a structure which, besides austenite, contains also ferrite, is preferable, provided that the ferrite portion does not predominate. It follows that austenitic Cr-Ni steels with the lowest possible carbon content (below 0.07 per cent.) and better still, the Cr-Ni-Mo steels, may be welded without any difficulty, preferably by the electric-arc process. If it is a question of specialised requirements, where welded chemical plant of these steels is required to possess the highest degree of corrosion-resistance, this may be achieved by subsequent reheating to about 1100°C. and quenching. It is possible also to employ, for welding, a steel with a uniformly heterogeneous structure, because material with this structure shows practically no tendency to inter-crystalline corrosion in the vicinity of the weld-zone.

If these suggestions are followed, satisfac-

* From an article in *Chemische Fabrik*, 1941, *12*, 231, by R. Weihrich and A. Rasch, of Poldihütte, Kladno, Czechoslovakia.

tory results can be obtained with the correct welding procedure with normal Cr-Ni or Cr-Ni-Mo steels, without the necessity for employing carbide-forming agents. However, there are a number of cases, in which the lower corrosion-resistance of the straight austenitic steels is not up to service requirements, and for such purposes the Cr-Ni and Cr-Ni-Mo steels with the addition of carbide-formers are necessary; they have replaced the former in industry, for example, for large-scale apparatus in the sulphite cellulose process. The actual reasons for this are various. It is not possible, for instance, to heat-treat very large chemical plant, after fabrication. However, it should be stated that when employing stainless steels with carbide-formers, it is necessary to conduct the welding process with considerable circumspection if unsatisfactory results from weld-decay are to be avoided. For instance, Ti, as opposed to Nb, very easily burns out during the welding, and grain-corrosion in the weld-zone cannot be prevented with certainty. In other words, not only the correct choice of steel, but also the right welding procedure is essential. With an unsatisfactory welding process, it will be found that the Ti-containing stainless steels will give no better results than those free from titanium.

The 18/8 Cr-Ni stainless steels are employed for the following applications in chemical plant: surgical instruments, milk-heating plant, dyeing plant, utensils and plant with strict chemical or chemical and mechanical requirements (pressure) for use with organic or inorganic acids and salts, storage vessels, pressure plant, autoclaves, distilling plant, evaporating plant, heating and cooling worms or cooling and absorption towers, storage tanks, pumps, gasholders, fat-melting kettles, gelatine moulds, sieves, etc.

In particular, steels Nos. 7-10 are used in preference to others in the sulphite cellulose industry, in rayon production, for acid-dyeing-baths and wool bleaching plant.

Several years' working experience has shown that even for quite severe requirements, the Cr-Ni-Mo steels (with carbide agents) need only contain 1.8 per cent. (instead of $2\frac{1}{2}$) Mo, for example, for such severe working conditions as piping, and valves in sulphite cellulose plants. Table 5 contains corrosion results with the Cr-Ni steels in sulphuric and sulphurous acid.

Austenitic Cr-Mn Steels

The 9-18 Cr-Mn steel owes its origin to the desire to develop a non-magnetic nickel-free, corrosion-resistant steel. On account of the low chromium content, such a steel can be considered as corrosion-resistant only with distinct reservation; while it is quite suited for decorative and domestic applications, it cannot be considered for use in chemical plant excepting refrigerating plant. All the Cr-Mn steels possess good toughness at very low temperatures (down to $-250°$C.) and are, for this reason, superior for certain applications to other steels, including the 18/8 Cr-Ni steels.

The second austenitic Cr-Mn steel (steel No. 12) has satisfactory corrosion-resistance, because of its high Cr-content, although the degree of resistance to chemical attack does not reach that of the 18/8 stainless. The former is, however, more tough compared with the straight Cr-steels and possesses many technical advantages (deep-drawing properties and good weldability), and is used in place of the 17 per cent. Cr steel, considerations of acid-resistance permitting, as for example, in the food industry generally, for fruit and vegetable processing, washing machines, etc. The steel welds well, but its stability to inter-crystalline corrosion is not perfect. It will be found satisfactory, where the chemical requirements are not too severe (for instance, it is not suited for nitric acid plant). It should be further mentioned that steel No. 12 can be cold-drawn, and finds application for corrosion-resisting springs.

Addition of carbide-forming elements is ineffective here, as such additions cause coarsening of the ferrite portion and the net result is that only steels with a semi-austenitic structure are obtained, which renders the high manganese additions useless.

Semi-austenitic Cr-Mn Steels

Application for this class of steel, particularly for steel No. 14, is at present limited. The strength of these steels is higher; and their deep drawing properties are not so good because of the coarser ferrite structure than those of the austenitic Cr-Mn-steels. Steel No. 13 can be used for similar purposes to steel No. 12. This is usually done when it is a question of higher strength. Steel No. 14, because of its Mo-content, has undoubted superior acid-resistance, but is not comparable to the 18/8 Cr-Ni steel with Mo addition.

Parliamentary Topics

Penicillin

IN the House of Commons recently, Mr. Salt asked the Minister of Supply whether he was in a position to indicate whether any arrangements had been made to enable British manufacturers to take full commercial advantage of the British discovery of penicillin; whether he could give any estimates of what our production of penicillin would be in a year's time; and how this would compare with American production.

Sir A. Duncan: Yes, sir. Many British manufacturers are now making penicillin or are making arrangements to do so, and any firm licensed for this purpose under the terms of the Therapeutic Substances Act will be given every encouragement to manufacture. It would be premature to give estimates of our production of penicillin in a year's time, but it will be substantial, though less than American production, and it will not only meet military needs but provide large quantities for civilian purposes.

Quinine in India

In reply to a question by Mr. R. Sorensen, Mr. Amery stated that 491½ million tablets of synthetic anti-malarial drugs were shipped to India in 1943. The shipments in 1944 to date total 632½ million tablets, in addition to 1000 lb. of totaquina. Quinine stocks in India in April, 1944, were 244,000 lb. Indian pre-war production of quinine was 90,000 lb. a year and is increasing. Pre-war consumption of quinine was about 200,000 lb. a year, while that of synthetic anti-malarial drugs was negligible.

Science Contacts with Russia

Mr. R. Morgan asked the Secretary of State for Foreign Affairs whether his attention had been called to the decision of the Australian Government to appoint a Scientific Attaché to Moscow; what was the present scientific establishment of His Britannic Majesty's Embassy in Moscow; and whether any plans were under consideration for strengthening it, in view of the importance of scientific relations with the U.S.S.R.

Mr. George Hall: The answer to the first part of the question is in the affirmative. As regards the second part, there is at present no officer on the staff of His Majesty's Embassy in Moscow with this specific duty. H.M. Government have for long been aware of the desirability of keeping in close contact with the developments and achievements of Soviet scientific thought. They suggested to the Soviet Government at the beginning of last year that a distinguished scientist should visit the Soviet Union to discuss with Soviet officials and scientists the improvement of scientific exchanges of a non-military character. The Soviet Government felt, however, that, in view of the fact that many scientific institutions have been removed to different and often remote parts of the U.S.S.R., the visit should be deferred.

LETTER TO THE EDITOR

Industrial Alcohol from Cellulose

SIR,—The article published in your issue of December 30, 1944, under the title "Industrial Alcohol from Crops" will surely find widespread interest and recognition in the industry concerned and in agriculture.

However, the raw materials mentioned in this article are mostly such as are needed for human nutrition. Scarcely anything is mentioned of the other sources suitable for the manufacture of the enumerated products. It is well known that alcohol has been produced, and is now being produced to a greatly increased extent, thanks to wartime conditions, from wood and sulphite black liquor, from wood cellulose, and even from wood pulp itself. It was also reported in your journal that in America alcohol production from waste wood is being studied and that the intention exists to put this into bulk practice. To produce alcohol from cereal straw and similar products has also been studied, but has so far not been found to be an economic proposition for peacetime. The same criticism was made when using pulp produced for this purpose in the normal way, because it would be too costly.

New processes have now been examined in this country for manufacturing pulp with a high cellulose content, using wastes with correspondingly low manufacturing costs. Since purified cellulose gives a much higher yield of alcohol than cellulosic material which is not precleaned, the outlet seems to be much more promising, probably also for peace-time conditions.

In an article published not long ago by the leading specialist of the Agricultural Residues Division, Northern Regional Research Laboratory, Peoria, one of the four institutes created by the U.S. Department of Agriculture early in 1941, it is mentioned that agricultural residues represent more than half the annual growth on cultivated lands the world over, and that any lasting basis for peace must take into account a much sounder economic structure for the farmer since food and fibre are necessities of life. Agricultural residues, among which cereal straw plays a big rôle, should thus find industrial utilisation, a point which may be regarded as a world-wide problem. To manufacture alcohol, etc., from straw and similar products may therefore be regarded as being of great importance in farming economics.—Yours faithfully,

G. ULLMANN, Ph.D.

Personal Notes

MR. D. P. C. NEAVE has been appointed a joint managing director of Imperial Smelting Corporation.

MR. R. W. FOOT, chairman of the Mining Association, has been appointed president for 1945 of the Coal Utilisation Joint Council.

PROFESSOR JOHN ORR, O.B.E., director of the Witwatersrand Technical College and a pioneer of technical education in South Africa, is to retire next year.

MR. LEYSHON DAVID, of Port Talbot, has just retired after 73 years' service with Vivian & Sons, Ltd., Port Talbot, a constituent company of I.C.I. Metals.

LIEUT. D. F. IRELAND, of Briton Ferry, who before joining H.M. Forces was a chemist with the Briton Ferry Steel Co., Ltd., has been awarded the M.C. for gallantry in action.

MR. H. R. HUMPHREYS, a director of Cammell, Laird & Co., Ltd., who has just joined the board of the English Steel Corporation, Ltd., is also to be appointed a director of Firth-Vickers Stainless Steels, Ltd.

SIR MURRAY MORRISON is retiring from the managing directorship of British Aluminium Co. on March 30, after fifty years' service. He will remain a director, and will be succeeded by MESSRS. G. CUNLIFFE (now general manager) and G. BOEX (now technical manager).

MR. R. D. WILLIAMS, president of the Tasmanian branch of the Australian Chemical Institute, has been elected president of the Institute. Mr. Williams is chief research chemist for the Electrolytic Zinc Co. of Australasia, Ltd., and has been with the company for 25 years. DR. H. E. DADSWELL has been appointed honorary general secretary of the Institute, and MR. F. J. WATSON (head of the chemistry department of Melbourne Technical College), honorary treasurer.

New Year Honours

Chemical science and the chemical and allied industries are represented in the first list of New Year Honours, which was published on January 1.

Among the list of Knights Bachelor are MR. FREDERICK WILLIAM BAIN, chairman of the Chemical Control Board, Ministry of Supply, and BRIGADIER L. E. H. WHITBY, lately bacteriologist at the Middlesex Hospital, honoured for his services in the development of the sulphonamide drugs. PROFESSOR JAMES CHADWICK, F.R.S., Professor of Physics at Liverpool University, receives the same award for services to the D.S.I.R., as does DR. EDWARD BAILEY, M.C., F.R.S., director of the Geological Survey of Great Britain, D.S.I.R. The part that industry has played is acknowledged by the award of knighthoods to MR. ARTHUR P. M. FLEMING, director of Metropolitan Vickers Electrical Co., Ltd.; to MR. ALLAN CAMPBELL MACDIARMID, chairman and managing director of Stewarts & Lloyds, Ltd.; and to MR. PETER BOSWELL BROWN, chairman and managing director of Hadfields, Ltd. Overseas knighthoods go to MR. J. J. GHANDY, agent of the Tata Iron and Steel Co., Ltd., and to MR. HAROLD ROPER, general manager of the Burmah Oil Co., Ltd.

In the Ministry of Fuel and Power, MR. ROBERT NORMAN DUKE, C.B., D.S.O., M.C., joint deputy secretary, is appointed K.B.E., and MR. ERIC ALFRED BERTHOUD, temporary assistant secretary, becomes C.M.G. The award of the O.B.E. to MR. F. OATES, chief geologist, Tanganyika, is an acknowledgment of the work done towards opening up the natural productivity of this territory.

In the second section of the Honours List, announcement is made of the award of the O.B.E. to the following: DR. R. A. FEREDAY, Ph.D., Senior Scientific Officer, Foreign Office; MR. R. P. FRASER, of the staff of the Imperial College of Science and Technology; MR. S. C. LAWS, Principal, Northampton Polytechnic, London; MISS M. SMITH, D.Sc., lately Investigator, Industrial Health Research Board; MR. C. L. SUTHERLAND, C.M.O., Silicosis Medical Board; MR. L. V. THOMAS, Principal Technical Officer, Petroleum Warfare Dept.; and DR. F. A. VICK, Ph.D., Assistant Director of Scientific Research, Ministry of Supply.

Obituary

MR. NORMAN M. JAMES, manager of the Ebbw Vale coke-oven plant of Richard Thomas & Co., Ltd., has died at the age of 45. He was one of the founders and a past-chairman of the Ebbw Vale Metallurgical Society.

The death is reported from Australia of MR. CRITCHLEY PARKER, proprietor of the *Industrial Australian and Mining Standard*, who died at South Yarra, Melbourne, on October 17, aged 82. Associated with the Press all his life, Mr. Parker embarked on the publication of scientific and technical literature in Australia as long ago as 1904, when there appeared to be small demand for such works. He was managing editor of the *I.A. and M.S.* from 1927 until his retirement from active participation some five years ago.

DR. HENRY DREYFUS, chairman of British Celanese, Ltd., died in London on December 30, aged 63. Dr. Dreyfus, a native of Switzerland, and a chemist before all else, was one of the pioneers in the development

of cellulose acetate rayon, his experiments on this material having attracted attention as far back as 1905. For over 30 years he had been the moving spirit of British Celansese, Ltd., and of the British Cellulose and Chemical Manufacturing Company, of which it was the successor. Before the last war Dreyfus collected a strong team of technical and commercial helpers to develop his processes, but the first really big step came in 1916, when the British Government selected the Dreyfus process for the manufacture of aircraft dope and a huge factory was built at Spondon. After the war Dreyfus turned his attention almost entirely to the production of yarn and fabric, and himself selected the well-known trade-name "Celanese" for the company's products. In 1938 he was awarded the Perkin Medal.

Since 1927, he and his brother Dr. Camille Dreyfus, who had been managing director of the Celanese Corporation of America, proceeded to purchase financial control of British Celanese, Ltd., and took over the whole direction themselves, with a view to pursuing a more active policy. The dividend announced a few weeks ago was the first to be declared by the company for many years, and its announcement without the publication of the company's profits was severely criticised by the Stock Exchange Committee. Dr. Dreyfus issued a spirited defence of his company's action just before Christmas, and it was expected he would deal with the matter from the chair at the annual meeting on January 16.

American Standards

Unifying Plan for Latin America

A PLAN to promote the adoption of uniform technical standards throughout the Americas as an aid to industrial and trade development is being extended as rapidly as possible through the co-operation of groups and individuals in 21 American countries.

Owing to the fact that industries have been established by technicians from many countries, there is an absence of uniform technical standards, which constitutes a definite obstacle to industrial development and trade expansion throughout the Americas. The problems arising from these discrepancies have been emphasised by war-time conditions which have accelerated industrialisation in many countries.

The war has also focussed attention on the advantages of the interchangeability of equipment between one American country and another. In many cases this has not been possible, thanks to differing standards, and, as a consequence, many countries have suffered because exchange of equipment and technical products has been limited. Another problem aggravated by the war has been the need for standard classifications of certain raw materials and some semi-manufactured and manufactured products, as to quality, identification, and analysis.

The uniform technical standards programme in the western hemisphere is being promoted by the joint action of the Inter-American Development Commission and its affiliated commissions in the 21 American countries, and the American Standards Association. These organisations are working in co-operation with existing standards bodies, business concerns, engineers, scientists, and government officials. This co-operative programme is an active step in carrying out one of the 45 resolutions adopted recently by the Inter-American Development Commission and its affiliated national commissions.

New Control Orders

Iron and Steel

THE Control of Iron and Steel (No. 37) Order, 1944 (S. R. & O. 1944, No. 1440), which came into force on December 30, permits any person to acquire, without licence, in any quantity, used barbed wire, wire road reinforcement fabric mesh, and wire staples. The Order also alters some of the maximum prices for iron and steel products, principally by reducing the prices for ferro-tungsten electrically melted steels, shell steel discards, high speed steel and certain alloy steels; and increasing the maximum prices for other alloy steels and for medium plates, springs, steel castings and wrought iron tubes and fittings. Maximum prices are provided for the first time for high speed steel drill rods, crank axles and parts, cold drawn Admiralty boiler tubes and gun billets. A list of the altered Related Schedules is included in the Order.

Export Licensing

The Export of Goods (Control) (No. 3) Order, 1944 (S. R. & O. 1944, No. 1424), operative from January 1, removes the following goods from the Schedule to the Export of Goods (Control) (No. 10) Order, 1943. They consequently require licences only when exported to those destinations to which the export of all goods is controlled:

Iron and steel (including alloy steel) in the form of castings and forgings, but not including machinery parts; stampings and pressings with or without rolled edges, but not including machinery parts; various types of ferrous and non-ferrous metal manufactured goods.

Lime; ultramarine blue; perfumery and toilet preparations whether medicated or not (but not including soaps); inks.

The above refers to export licensing requirements only and does not in any way affect any regulations which may be in force governing the manufacture of goods.

Rubber from Milkweed

Canadian Chemical Engineers' Achievement

AN interesting story has come from the National Research Council of Canada of the extraction of rubber from a Canadian plant—the common milkweed. Dr. N. H. Grace, Mr. J. Klasson and Dr. R. W. Watson, of the Research Council (*Deco Trefoil*, Aug., 1944) give an account of investigations undertaken in 1942 to produce even comparatively small amounts of rubber from indigenous plants. Only two plants were found to be of particular interest—the common milkweed and the Russian dandelion. Supplies of the latter not being available, the work of rubber extraction was directed to the study of the various strains of the milkweed. In the late season, dried milkweed leaves contain from 3 to 4.5 per cent. rubber, the resin fraction varying from 10 to 18 per cent. As the stems contain only minute amounts of rubber the extraction procedure was focussed on the leaves.

In the laboratory experiments over 90 per cent. of the rubber hydrocarbon was extracted in the form of a soft tacky material containing 25 to 40 per cent. rubber and 35 to 45 per cent. resin, the residue being composed of detritus. The pilot plant laid out for treatment on a batch basis comprised machinery for cooking, washing, filtering, pebble milling, flotation, thickening, agglomerating and drying, the average batch being 80 to 90 lb. weight of air-dried leaves.

Cooking is carried out in autoclaves in two stages—the first being a simple water digestion, while during the second stage cellulosic material and lignin are decomposed by treatment with a 1 per cent. caustic soda solution at 15 lb. pressure. Substances liable to emulsify the gum are washed out of the cooked leaves in a trommel. Then follows filtration through muslin—the filtrate having a *p*H of 11.2 to 11.8 and a 90 per cent. water content.

Grinding and Screening

In its natural form the gum is minutely dispersed throughout the cells of the leaves as a resin-rubber. To effect the release of these minute particles of gum from the cells the product is ground in pebble mills. Prolonged milling would cause the formation of rubber aggregates, floatable only with great difficulty, and therefore a period of 3½ hours is considered adequate. The mill product is passed over a 60-mesh vibratory screen, the undersize being pumped to the flotation cells, the oversize being returned for regrinding.

A concentrate of the resin-rubber constituents is obtained by treatment in a 6-cell Denver Sub A froth flotation machine. No frothing or collecting agents are required, and the flotation pulp density is maintained at 1.2 to 1.8 per cent. Chlorophyll in the leaves is concentrated with the rubber, the green colour providing a guide to the relative cleanliness of the tailings. According to the published results, the final flotation concentrate carries 4.7 per cent. solids, the solids averaging almost 30 per cent. resin and 20 per cent. rubber hydrocarbons, the final tailing solids containing 3.2 per cent. and 0.4 per cent. respectively. Thickening of the flotation concentrate before agglomerating is effected in hopper-bottomed dewatering tanks.

Batch agglomeration is practised, the dewatered concentrate being treated in a pebble mill. The suspension fed to the pebble mill is heated to boiling point by the injection of steam to accelerate the agglomeration of the resin-rubber particles. After five hours the charge is passed over an 80-mesh vibratory screen, undersize being sent back to the flotation cells while the oversize is returned to the pebble mill. A further half-hour of agglomeration at boiling point suffices to bring all the resin-rubber into one single lump weighing from 6 to 14 lb.

The Drying Process

Drying is essential to remove the 20 to 30 per cent. moisture remaining in the resin-rubber. Rubber washing-rolls work the lump of resin-rubber into corrugated sheets, 1/16-in. thick. These sheets are spread on wire screening and are air-dried in an oven at 60°C. for about two days. At the end of this time the moisture is reduced to 0.5-1.0 per cent. and the gum is ready for test.

Although probably not a commercial proposition in normal times, the process shows that under the stress of war vital raw materials may be obtained from very unexpected sources.

GLASS AND CHEMISTRY

At a recent meeting of the Hull section of the Oil and Colour Chemists' Association, Dr. R. E. Bastick delivered a lecture on "Modern Technical Glasses." He said that it was possible to foretell the physical properties of a glass from the chemical composition. At room temperature glass exhibits the properties of a solid—it is quite rigid and elastic—but if we heat glass and measure its viscosity we find that it passes very gradually through a range of viscosities. The necessity to devise suitable refractories to prevent solvent action by the glass was a problem, said Dr. Bastick. Some glasses were so corrosive on ordinary clay materials that they had to be made in platinum pots.

General News — From Week to Week

The Minister of Supply has made the Control of Iron and Steel (No. 38) (Scrap) Order, 1944 (S. R. & O. 1944, No. 1423), which came into operation on December 30, 1944, reducing the prices of scrap steel containing tungsten.

There will be no change in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers' and large trade users during the five weeks ending February 3, 1945, announces the Ministry of Food.

During 1944 contributing members of the Red Cross Penny-a-Week Fund raised £5,500,000 for the Red Cross and St. John, an increase of £1½ million on the figure for 1943. In five years they have contributed over £14,250,000.

An ingenious method for the detection of the presence and segregation of lead in steels and brasses by means of "lead prints" is recorded in the *Analyst* (1944, 69, p. 368) by Dr. B. S. Evans. Advantage is taken of the distinctive scarlet colour of the dithizone compound, using either filter paper (for detection) or gelatin paper (for segregation) for the prints.

Oxygen and penicillin are carried by the new Canadian-built "Norseman" aircraft which are being used to transport the wounded from immediately behind the front line. These tiny craft, which can carry three stretcher cases or five walking wounded, are "able to land on a cow-pasture," according to their pilots' claim, and carry the wounded back to bigger air-strips, where they can be transferred to larger transport aircraft.

The directors of British Coal Distillation, Ltd., report that they have interested a group of industrialists in the possible purchase and reconstruction of the Suncole (Nottingham) works and plant, which were recently dismantled by George Cohen & Son, Ltd. The modernisation of the plant, with the addition of a tar distillation unit, is being considered, with a view towards an important project for the more scientific usage of raw coal and its chemical derivatives.

The reconditioning, by a simple method, of lac which has become unsuitable through age, polymerisation, or enemy action, is described by Kamath and Gidvani in *Technical Paper No.* 25 of the London Shellac Research Bureau (*Reconditioning of Old and Blitzed Lacs*). The lac is dissolved in either sodium carbonate or hydroxide solution, with heat, and reprecipitated with dilute sulphuric acid. Quantity of alkali, and time and temperature, vary with the type of the lac; and the process is designedly flexible.

As from January 1 there is a reduction in the prices of the antimony metal and antimony compounds sold on behalf of the Ministry of Supply by the Cookson Lead and Antimony Co., Ltd., Newcastle-on-Tyne; St. Helens Smelting Co., Ltd., St. Helens; and Hallett and Son, London. The reduced prices per ton are as follows: Antimony metal, 99.6 per cent., £112 10s.; antimony metal, 99 per cent., £105; antimony oxide, £105; crude antimony, £90.

The addition of 120 names to the list of persons in neutral countries with whom dealings of any kind are unlawful, is made in the Trading with the Enemy (Specified Persons) (Amendment) (No. 15) Order, 1944 (S.R. & O. 1944, No. 1377). Included are: O.D.A. (Oficina Distribuidora Americana de Productos Químicos), Buenos Aires; Aceros Suecos Sandvik, Barcelona; Dixon Oil Co. (Lubrificantes Dixon), Málaga; and Metallisering A/B, Stockholm. A considerable number of deletions is also made.

Foreign News

Among new factories to be established soon in Turkey is one for soap manufacture at Kayseri.

The Nizam of Hyderabad has sanctioned a sum of Rs. 15 lakhs for the establishment of an Industrial Research Institute in Hyderabad.

The Argentine Government has issued a decree providing for the annual production of up to 120,000,000 litres of power alcohol from maize.

A new coal mine has been opened near Nnemi, in the Eastern provinces of Nigeria. The seam, described as rich in high-grade coal, was discovered in 1920.

United States turpentine stocks, held by the Commodity Credit Corp., have recently been reduced from 277,000 units to less than one-tenth of that quantity.

The Government of Travancore, the leading rubber-producing area in India, intends to expand the rubber-manufacturing industry.

The Steel Company of Canada intends to instal cold-rolling mills and finishing equipment "to diversify still further the range of products," states the president. Earlier in the year plans were announced for the construction of a hot strip mill.

Penicillin is being produced on a laboratory scale at a plant near Stockholm. Plans for a full-scale plant are being made. It is reported that new moulds which give increased yields of penicillin have been discovered.

In Canada, the sale of zinc has been modified to allow unrestricted sales and the use of zinc and zinc oxide in quantities not exceeding 5000 lb. a month.

The output of 6060 workers in Palestine's metal industry in 1943 had a value of £P3,870,000 compared with an output valued at £P643,000 in 1937, when 1950 workers were employed.

The Indian Association for the Cultivation of Science reveals in its annual report for 1943 that its chemical laboratory has been renovated and that work on indigenous drugs is to be taken up there.

The protection accorded the glass-manufacturing industry of India since June 1935, in the form of a refund of a part of the import duty on soda ash imported for glass making, has been continued until June 22, 1946.

Switzerland supplied the International Red Cross in 1943 with considerable quantities of alkaloids, glucosides and chemo-therapeutical preparations to combat diseases and epidemics. Vitamins were also supplied.

The Indian Geological Survey has discovered the occurrence of mica in the West Godavari district on two tributaries of the Mani Vagu river. Systematic development of graphite found in the same area is expected to yield a few hundred tons annually.

In Colombia, the Instituto de Fomento Industrial plans to establish a plant at Zipaquira to manufacture soda compounds. Arsenic will be mined and arsenic products manufactured at another works near Samana in the Department of Caldas.

The Lenin Soda Factory, Voroshilovgrad Oblast, has been partially restored and now produces 230 tons daily. Its annual production formerly amounted to 400,000 tons, more than half the total pre-war output of the country.

The development of a new ingredient, which expands the usefulness of synthetic rubber, has been announced by the Goodyear Tyre and Rubber Co. The new substance, a synthetic resin, dispenses with the use of carbon black in certain instances.

Shipments of United States products to Italy for the period from July 1, 1943, to September 10, 1944, included 28,900 ship tons of agricultural chemicals, 300 ship tons of matches, 100 ship tons of printing ink, and 3900 ship tons of soap.

No metals are produced in Iraq. There is no smelting or refining of ores and no processing of metals and minerals. Deposits of iron and copper are reported to exist in Northern Iraq, but no mining has been undertaken. Imports of metals and minerals ordinarily are limited to those which have been subjected to some form of manufacture or are in the form of sheets, bars, or flat shapes.

The exportation from Ecuador of plants, seeds, cuttings and shoots of pyrethrum has been prohibited.

Forthcoming Events

January 8, Institute of Fuel, Central Station Hotel, Newcastle-on-Tyne, 5.15 p.m. Messrs. H. L. Riley, J. Blaydon, and H. E. Gibson: "The Molecular Nature of Coking Coal Bitumens."

January 10. Institute of Fuel, Institution of Electrical Engineers, Savoy Place, Victoria Embankment, S.W.1. Sir Alfred Egerton, F.R.S., and Malcolm Pearce: "Methane."

January 10, A.B.C.M. Fuel Efficiency Technical Discussions. Reynolds Hall, College of Technology, Manchester, 3 p.m. Mr. A. L. Hancock (Electroflo Meters Co., Ltd.): "Boilerhouse Instruments and Automatic Control."

January 10, Society of Chemical Industry (Microbiological Panel). Rooms of the Chemical Society, Burlington House, London, W.1, 2.15 p.m. Papers by Dr. P. M. Shattock, Prof. G. S. Wilson and Dr. W. P. K. Findlay.

January 15, Royal Institute of Chemistry, in the Chemistry Lecture Theatre of the University of Leeds, 6.30 p.m. R. C. Chirnside: "The Compleat Analyst."

January 17, Institute of Fuel, James Watt Memorial Institute, Birmingham, 2.30 p.m. Mr. A. T. Green: "The Properties of Refractory Materials and their Significance to Fuel Economy."

January 18, The Royal Institution, Albemarle Street, W.1, 5 p.m. Dr. L. A. Jordan: "Paint—The Art and the Science" (Jubilee Memorial Lecture).

January 18, The Chemical Society, Burlington House, 2.30 p.m. Professor J. M. Robertson: "Diffraction Methods in Modern Structural Chemistry" (Tilden Lecture).

January 19, Institute of Fuel (with S.C.I.), Royal Technical College, Glasgow, 5.45 p.m. Professor D. T. A. Townend: "New Era in Combustion."

January 19, Chemical Engineering Group, S.C.I., Chamber of Commerce, New Street, Birmingham, 6.30 p.m. Mr. G. Lowrie-Fairs: "Calder-Fox Scrubbers and the Factors Influencing their Performance."

January 19, Society of Leather Trades' Chemists (London and Home Counties Group). Leathersellers' College, Tower Bridge Road, S.E.1, 2.30 p.m. Mr. J. R. Blochey and others: "What the Leather Industry Expects from the Scientist."

January 20. Institution of Factory Managers, Oak Room, Kingsway Hall, W.C.2, 2.30 p.m., extraordinary general meeting.

January 22. Electrodepositors' Technical Society, Northampton Polytechnic Institute, St. John Street, Clerkenwell, E.C.1, 5.30 p.m. Dr. S. G. Clarke and Mr. J. F. Andrews: "The Chromate Passivation of Zinc."

January 24, A.B.C.M., Fuel Efficiency—Technical Discussions. Meeting Room No. 1, Gas Industry House, 1 Grosvenor Place, S.W.1, 2.30 p.m. Mr. A. L. Hancock (Electroflo Meters Co., Ltd.): "Boilerhouse Instruments and Automatic Controls."

Company News

The Standard Chemical Co. has declared an interim dividend of 50 cents (same).

British Coal Distillation, Ltd., reports a loss of £5935 for the 19 months to July 31, making an accumulated debit of £40,148 (£34,213).

Aluminium, Ltd., Canada's largest aluminium producer, omitted, for the first time since 1940, the payment of the usual year-end extra dividend of $2.

Asbestos Corporation reports a regular quarterly dividend of 20 cents and an extra dividend of 10 cents, making a total of $1 for the year ($1.30).

Dussek Bros. & Co., Ltd., announce a final dividend of 8½ per cent. (same), making 12½ per cent. (same). Profits for the year to October 31, before taxation, amount to £20,635 (£21,174).

Chemical and Allied Stocks and Shares

REFLECTING the general tendency of markets, shares of chemical and kindred companies have closed 1944 below best prices recorded in the past year, but substantially above the lowest levels. In most instances only small yields are shown on the basis of latest dividends, indicating hopeful views of the post-war outlook. It is being assumed that later on there will be scope for higher dividends, granted that E.P.T. is eventually abolished and that there is relaxation of Government controls during the change-over to peace-time working. Many shares are now on a very small yield basis, more particularly where recent dividends have been below pre-war, and where there are considered to be reasonable prospects of the restoration of higher dividends in due course. Lever & Unilever, for instance, are expected in the market to return to a 10 per cent. dividend basis as time proceeds, and the units of the Distillers Co. may restore the dividend rate from 18¾ per cent. to 20 per cent.

The following table includes a number of representative shares of chemical and kindred companies, giving highest and lowest levels touched in 1944, together with the last dividend and yields at current prices:

	1944 Extremes	Current Price	Last Div. %	Yield %‡
Imperial Chemical	41/- —37/-	39/-	8	4⅛
Turner & Newall	87/- —77/-	81/3	12½	3
B. Laporte ...	87/3 —75/-	85/-	15	3½
Fisons	55/3 —46/3	52/-	10	3⅞
Borax Consolidated... ...	41/- —34/9	36/9	7½	4⅛
Gas, Light and Coke	23/10½—18/-	22/6	4	3½
Lever & Unilever	46/9 —34/10½	46/-	5	2⅛
Distillers ...	109/- —87/6	109/-	18¾	3½
Gen. Refractories†	18/9 —15/-	17/4½	7½	4¼
De La Rue ...	9 15/16 — 7 9/16	9 15/16	40	4⅛
Staveley ...	57/1½ —48/3	52/6	7*	5¼§

† 10/- shares. * Tax free. § Gross. ‡ Approx.

Turner & Newall is included among companies generally expected to return to the pre-war dividend basis in due course. The latter was 20 per cent., comparing with 12½ per cent. in recent years. Triplex Glass is another instance, the past year's 15 per cent. comparing with dividends of up to 25 per cent. before the war; current price is 43s. 3d. and the 1944 extremes were 46s. 9d. and 35s. 3d. Other shares now on a very small yield basis, because of hopes of an eventual return to pre-war dividends, include British Drug Houses, Pinchin Johnson, Wall Paper Manufacturers deferred, Barry & Staines, Nairn & Greenwich, Allied Ironfounders, General Refractories, Dunlop Rubber, and Associated Cement. The last-named, which paid 22½ per cent. pre-war, are now on a 10 per cent. basis; current price is 62s., comparing with 1944 extremes of 71s. 1½d. and 58s. 9d.

Richard Thomas 6s. 8d. units, now 13s. 6d. following the approval of the merger with Baldwins, had extreme levels of 14s. 9d. and 9s. 3d. last year. In the case of Stewarts & Lloyds, the extremes for 1944 were 59s. and 50s. 6d., comparing with the current price of 55s. 3d. Dorman Long, now 27s. 7½d. had 1944 extremes of 29s. 6d. and 24s. 4½d. British Industrial Plastics 2s. shares fluctuated between 8s. 3d. and 6s. 3d. last year, and are now 8s. British Plaster Board (now 40s.) moved between 28s. 4½d. and 42s. 7½d. last year; British Aluminium (46s.) between 52s. 3d. and 45s 6d.; British Oxygen (87s. 6d.) between 92s. 6d. and 78s. 9d.; and Dunlop Rubber (now 48s.) reached extremes of 50s. 9d. and 39s. 6d. in 1944. General Electric 1944 extremes were 100s. and 88s. 9d. and the current price 98s. 3d. Boots Drug 5s. units attracted increased attention as an invesment in view of the particularly strong balance sheet and the assumption that pre-war distributions are likely to be fully restored in due course; the current level of 55s. 9d. compares with highest and lowest prices of 61s. 9d. and 41s. 1½d. last year. In the case of United Glass Bottle the cur-

rent level of 70s. compares with 1944 extremes of 73s. 9d. and 58s. 9d. British Glues & Chemicals 4s. ordinary (1944 extremes 9s. 10½d. and 7s. 4½d.) are now 9s.

British Chemical Prices

Market Reports

QUIET conditions prevail in most sections of the London general industrial chemicals market. Contract deliveries have been up to schedule but the customary slackening of interest in fresh business at the close of the year has been reported, with the price position showing little if any alteration. In the soda products section a fair interest has been displayed in bicarbonate of soda and soda ash and supplies of bichromate of soda and chlorate of soda are fully absorbed. Hyposulphite of soda, Glauber salt, and salt cake are firm. A fair inquiry is reported for acetate of soda, while yellow prussiate of soda remains scarce. The supply position continues to be the chief problem in the potash section and ready outlets are reported for liquid caustic potash, bichromate of potash, and yellow prussiate of potash. In other directions arsenic, hydrogen peroxide, and formaldehyde are steady and zinc oxide is in moderate demand. There is no special feature to record from the coal-tar products market this week, deliveries against contracts being the chief activity.

MANCHESTER.—The Manchester chemical market is gradually getting back to the conditions prevailing before the holidays. Up to the present there has not been a great deal of new business offering, and not much either in the way of inquiries, but these may be expected to make their appearance again before long. In the meantime, textile chemicals are being steadily absorbed under contracts, and deliveries to other using industries during the week have been on a fair scale. Quotations are well held throughout the range. In fertilisers, supplies are being fairly well aborbed in most sections, while among the tar products creosote and anthracene oils, crude tar, and most of the light materials are going steadily into consumption.

GLASGOW.—Home business in the Scottish heavy chemical trade, in the period up to the New Year holiday and during the preceding week, remained moderate. Prices were very firm and export inquiries quiet.

Price Changes

Antimony Oxide.—£105 per ton.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.

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